

What is claimed is:

1. An MRI apparatus configured to obtain an ASL (Arterial Spin Labeling) image of a region to be imaged in a subject by performing a scan to said region to be imaged independently in a control mode and in a tag mode according to a pulse sequence based on an ASL technique, wherein:

said pulse sequence is set with a velocity-selective pulse that selectively excites magnetization spins in a fluid passing through said region to be imaged and having a constant velocity range for the spins to undergo transition to transverse magnetization, and then performs excitation to cause the transverse magnetization to flip back to longitudinal magnetization; and

said velocity-selective pulse is formed in such a manner that the longitudinal magnetization excited in each of said control mode and said tag mode is reversed in polarity upon velocity-selective excitation by said velocity-selective pulse.

2. The MRI apparatus according to Claim 1, wherein:

said velocity-selective pulse is applied to said subject non-slice-selectively.

3. The MRI apparatus according to Claim 1, wherein:

said velocity-selective pulse includes a first flip pulse applied first on a time axis, an inversion pulse applied after said first flip pulse, a second flip pulse applied after said

inversion pulse, and a velocity encode pulse applied in a period after said first flip pulse is applied and before said inversion pulse is applied and in a period after said inversion pulse is applied and before said second flip pulse is applied.

4. The MRI apparatus according to Claim 3, wherein:

in a case where the scan by said pulse sequence is performed in a plurality of shots and said ASL image is obtained by averaging data acquired from respective scans, said velocity encode pulse is formed in such a manner that a quantity of velocity encode for the spins within said subject that are subjected to a phase shift from the transverse magnetization to the longitudinal magnetization by application of said velocity encode pulse is variable in each shot, so that a magnetization-to-flow velocity characteristic of the spins forms an arbitrary shape.

5. The MRI apparatus according to Claim 3, wherein:

said velocity-selective pulse further includes a gradient magnetic field pulse that is applied together with said first and second flip pulses as well as said inversion pulse, and spatially selects a region including said region to be imaged.

6. The MRI apparatus according to Claim 3, wherein:

each of said first and second flip pulses comprises a 90° RF pulse, and said inversion pulse comprises a 80° RF pulse.

7. The MRI apparatus according to Claim 3, wherein:

the polarity of said velocity encode pulse is reversed between said control mode and said tag mode and said second

flip pulse is set to a same flip phase in both of said modes.

8. The MRI apparatus according to Claim 3, wherein:

said velocity encode pulse is set to a same polarity in both of said control mode and said tag mode, and a flip phase of said first or second flip pulse is inverted between said modes.

9. An MRI apparatus configured to obtain an ASL (Arterial Spin Labeling) image of a region to be imaged in a subject by performing a scan to said region to be imaged independently in a control mode and in a tag mode according to a pulse sequence based on an ASL technique, wherein:

said pulse sequence includes a slice-selective pulse that spatially selects a region outside said region to be imaged and excites magnetization spins within said region for the spins to undergo transition to transverse magnetization, and a velocity-selective pulse that selectively excites magnetization spins in a fluid passing through said region to be imaged and having a constant velocity range for the spins to undergo transition to transverse magnetization, and then performs excitation to cause the transverse magnetization to flip back to longitudinal magnetization.

10. The MRI apparatus according to Claim 9, wherein:

said velocity-selective pulse includes a first flip pulse applied first on a time axis, an inversion pulse applied after said first flip pulse, a second flip pulse applied after said

inversion pulse, a velocity encode pulse applied in a period after said first flip pulse is applied and before said inversion pulse is applied and in a period after said inversion pulse is applied and before said second flip pulse is applied, and a gradient magnetic field pulse that is applied together with said first and second flip pulses as well as said inversion pulse and spatially selects a region including said region to be imaged.

11. The MRI apparatus according to Claim 10, wherein:
said slice-selective pulse is formed to select a predetermined region that resides on an upstream side of the fluid flowing into said region to be imaged and is adjacent to the region including said region to be imaged, which is selected by said velocity-selective pulse, without any gap in between.

12. The MRI apparatus according to Claim 11, wherein:
strength of said velocity encode pulse and a flip phase of said second flip pulse are set in such a manner that the longitudinal magnetization of the magnetization spins in the fluid excited via said slice-selective pulse and said velocity-selective pulse is of a same polarity in both of said control mode and said tag mode.

13. An MRI apparatus configured to obtain an ASL (Arterial Spin Labeling) image of a region to be imaged in a subject by performing a scan to said region to be imaged independently

in a control mode and in a tag mode according to a pulse sequence based on an ASL technique, wherein:

said pulse sequence includes a pulse train that spatially selects a region outside said region to be imaged and excites magnetization spins within said region for the spins to undergo transition to transverse magnetization, and selectively excites the magnetization spins in a fluid passing through said region to be imaged and having a constant velocity range for the spins to undergo transition to transverse magnetization, and then performs excitation to cause the transverse magnetization to flip back to longitudinal magnetization.

14. An MRI apparatus configured to obtain an ASL (Arterial Spin Labeling) image of a region to be imaged in a subject by performing a scan to said region to be imaged independently in a control mode and in a tag mode according to a pulse sequence based on an ASL technique, wherein:

said pulse sequence includes a velocity-selective pulse that selectively excites magnetization spins in a fluid passing through said region to be imaged and having a constant velocity region for the spins to undergo transition to transverse magnetization, and then performs excitation to cause the transverse magnetization to flip back to longitudinal magnetization; and

said velocity-selective pulse includes a pulse train that spatially selects a region including said region to be imaged.

15. An MRI apparatus, comprising:

means for obtaining an ASL (Arterial Spin Labeling) image of a region to be imaged in a subject by performing a scan to said region to be imaged independently in a control mode and in a tag mode according to a pulse sequence based on an ASL technique, said pulse sequence being formed to include a velocity-selective pulse that selectively excites magnetization spins in a fluid passing through said region to be imaged and having a constant velocity region for the spins to undergo transition to transverse magnetization, and then performs excitation to cause the transverse magnetization to flip back to longitudinal magnetization;

phase compensation quantity computing means for finding a quantity of compensation for a phase of said velocity-selective pulse; and

phase compensating means for reflecting the quantity of compensation computed by said phase compensation quantity computing means to said pulse sequence.

16. The MRI apparatus according to Claim 15, wherein:

said velocity-selective pulse includes a first flip pulse applied first on a time axis, an inversion pulse applied after said first flip pulse, a second flip pulse applied after said inversion pulse, and a velocity encode pulse applied in a period after said first flip pulse is applied and before said inversion pulse is applied and in a period after said inversion pulse

is applied and before said second flip pulse is applied; and

said phase compensation quantity computing means includes,

pre-scan means for obtaining echo signals by performing a pre-scan to said subject using a measuring pulse train,

phase distribution computing means for computing a phase distribution of echo signals from said echo signals obtained by said pre-scan, and

compensation quantity computing means for computing said quantity of compensation using the phase distribution computed by said phase distribution computing means.

17. The MRI apparatus according to Claim 16, wherein:

said compensation quantity computing means is means for computing a quantity of compensation for spatial 0-order and first-order distributions of said phase; and

said phase compensating means is means for compensating for a phase of said second flip pulse with a quantity of the 0-order phase compensation, and compensating for strength of said velocity encode pulse with a quantity of said first-order phase compensation.

18. An ASL (Arterial Spin Labeling) imaging technique for obtaining an ASL image of a region to be imaged in a subject by performing a scan to said region to be imaged independently in a control mode and in a tag mode according to a pulse sequence based on an ASL technique, wherein:

said pulse sequence is set with a velocity-selective pulse that is a pulse train for selectively exciting magnetization spins in a fluid passing through said region to be imaged and having a constant velocity range for the spins to undergo transition to transverse magnetization, and then performing excitation to cause the transverse magnetization to flip back to longitudinal magnetization, and formed in such a manner that the transverse magnetization excited in each of said control mode and said tag mode gives rise to a phase shift in an opposite polarity upon velocity-selective excitation by said velocity-selective pulse; and

the scan is performed using said pulse sequence.

19. An ASL (Arterial Spin Labeling) imaging technique for obtaining an ASL image of a region to be imaged in a subject by performing a scan to said region to be imaged independently in a control mode and in a tag mode according to a pulse sequence based on an ASL technique, wherein:

as said pulse sequence, a slice-selective pulse that spatially selects a region outside said region to be imaged and excites magnetization spins within said region for the spins to undergo transition to transverse magnetization is applied, after which a velocity-selective pulse that selectively excites magnetization spins in a fluid passing through said region to be imaged and having a constant velocity range for the spins to undergo transition to transverse magnetization, and then

performs excitation to cause the transverse magnetization to flip back to longitudinal magnetization is applied, followed by an imaging pulse train.

20. An ASL (Arterial Spin Labeling) imaging technique for obtaining an ASL image of a region to be imaged in a subject by performing a scan to said region to be imaged independently in a control mode and in a tag mode according to a pulse sequence, including a velocity-selective pulse, based on an ASL technique, wherein:

a quantity of compensation for at least 0-order and first-order phases of said velocity-selective pulse is found, and the computed quantity of compensation is reflected to said pulse sequence.